

Earth Construction: Ancestral Techniques for Current Problems



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Opinion

It is undeniable that earth architecture is found in all the regions and civilizations of the world, Fig. 1, strongly rooted in the culture of each town and popular knowledge of each region, being evidence of this the city of Jericho (Israel), the Village Katal Hüyük (Turkey), the citadels of the Chimú culture in Chan Chan (Peru), the reinforced earth wall of Joya de Cerén (El Salvador), and different archaeological findings in Africa, Asia, Europe and America. It is a technology that is still used today, and due to technological knowledge, it has been possible to improve the different techniques that involve earth as a raw material. In many localities the housing situation is really critical, due to a housing deficit or the structural deterioration of precarious housing, which risk the lives of those people who inhabit those constructions. There are

cases in which the use of alternative construction techniques is a solution to this problem, so it is resorted to buildings where clay soils, sand and straw are the main components in this construction types. The earth constructions techniques can be classified into three large groups:

- Rammed earth,
- Earth in blocks, the most characteristic is the adobe and
- Framework mixed techniques, the best known is the bajereque or wattle and daub. Existing a big number of different techniques within each group, associated with popular knowledge.



Figure 1: Mapa mundial de construcción con tierra.

There are so many benefits about these types of constructions compared with constructions where baked brick and reinforced concrete technique are used. Under this concept, can be referred about a harmonious interaction with the environment, because is a sustainable construction that uses natural resources that are available in the area where is going to be built, allowing to reduce the consumption of energy used during the construction. transport of raw materials over long distances and at the same time reduce the environmental impact produced by the waste generated in the different stages of construction, and in many cases that waste can be reused with the simple addition of water, as long as

they have used natural mixtures without chemical additives, un like the construction elements used in traditional systems, from the process of extraction, manufacture and transformation of most of the elements of construction that involves the alteration of the environment, the consumption of large amounts of energy and the consequent CO₂ emissions.

One of the most relevant aspects for earth architecture users is the inner comfort. Many people suffer from a health disorder due to the indoor air quality that is affected by the moisture content. In cases where humidity levels are very fluctuating, such as in bathrooms and kitchens, the earth walls are protected with a

plaster that allows them to absorb excess moisture and then when it is necessary to release moisture to the indoor environment. Equally, it can be talk about the thermal transmittance, where for adobe walls, with thickness of 0.35m, has a value of 1.93W/m²K, for wattle and daub walls with 0.30m thickness the conductivity is 0.83 W/m²K and for brick walls with 0.30m thickness the conductivity is 0.81 W/m²K. It can be seen the thermal advantage of the earth walls compared to the industrialized, where the first cases are more insulating and allows the interior of the house being warmer in winter and cooler in summer, which is an important benefit at the time of heating or refrigerate at different times of the year.

In reference to the structural response, it can be said that, in most cases of earth walls, the compressive and shear strength are low compared to traditional constructions, however, if in adobe construction incorporates wooden slats between the courses, improves its behavior. In the case of mixed construction techniques,

has a main structure of wood and the internal part of the walls have a framework of wooden slats or reeds, and then it is covered with the mud mixture, this wall type is more flexible, resistant and stable. Finally, it can be said that the earth as construction material can be considered safe, is sustainable and reusable. It is an abundant material and does not need to be transported long distances. Because it does not require great technical knowledge, it allows a self-construction or by mutated help in the communities, which reduces the costs invested in the construction. Once the construction life is over, it returns to its place of origin without producing environmental pollution. These systems, which have been used in the past, are used nowadays and will continue to be used in the future, is for this reason they deserve that both, people from the communities and construction professionals, dedicate time to optimize the different techniques and that can be used in a larger scale and can help reduce the latent housing problem and simultaneously environmental pollution.



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